

United States Department of Agriculture,

DIVISION OF AGROSTOLOGY.

[Grass and Forage Plant Investigations.]

RANGE GRASS AND FORAGE PLANT EXPERIMENTS AT HIGHMORE, S. DAK.—REPORT OF PROGRESS.*

The cooperative range grass and forage plant experiments at Highmore, S. Dak., begun in the spring of 1899 and conducted in cooperation with the South Dakota Experiment Station, were continued during the season of 1900, and the present circular is based upon the report of Mr. Louis W. Carter, who has had immediate charge of the work. In 1899 there were cultivated 74 plats, including 42 varieties of grasses and forage plants, all but 12 of which were perennials. In 1900 57 varieties were grown, of which 27 were not grown in 1899. These were as follows: Meadow fescue, red fescue, *Bromus erectus*, *B. kalmii*, *B. tectorum*, orchard grass, Washington blue-grass, Japanese barnyard millet, white Russian broom-corn millet, Samarkand alfalfa, French alfalfa, Australian saltbush, bitter vetch (*Lathyrus sativus*), white milo maize, Egyptian corn, March rape, Canadian lyme grass, blue Canadian lyme, goose wheat, oats, barley, speltz, emmer, Russian buckwheat, *Vicia faba*, white soy beans, sweet clover.

The season of 1900 was peculiar in that, although the rainfall was larger than usual, the season as a whole was very unfavorable. The preceding winter was dry and without snow until the latter part of March, when there was a fall of 8 inches. This, together with a fall of 3.2 inches of rain at the end of April, furnished favorable conditions for the germination of seeds, but was followed by a protracted drought of about seven weeks. During that period hot winds blew a part of the time, the prairie turned yellow, ponds dried up, and wells began to fail. The drought was general over South Dakota and all grasses and grains suffered, but cultivated crops, like corn and potatoes, when well tended, resisted the drought and

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suffered little. Rains in the first half of July were followed by a period of hot, dry weather, accompanied by hot winds, which produced serious injury and was fatal to corn which was drilled or planted thickly. Corn in hills and well cultivated resisted the drought, which fact shows that methods of culture tending to conserve the soil moisture are of great importance. There was a rainfall of 7.2 inches in August and 4.39 in September.

The report includes a record by plats, following the system presented in the first report.

PLAT A (1).—Smooth bunch grass (*Poa levigata*). After the June rains the grass resumed its growth, interrupted by the spring drought, and formed quite a sod, but did not get over 6 inches high and did not form heads.

A part of the plat was plowed up and sown to the seed of this grass, but the young plants were all killed by the drought.

PLAT A (2).—East half. Bunch grass (a form of *Poa levigata*). Good growth in May, but did not head out. Formed a good sod latter part of summer.

The west half, in Canadian blue grass (*Poa compressa*), made a good growth early in the season and headed out June 1, but formed no seeds.

PLAT A (3).—Nevada blue grass (*Poa nevadensis*). Condition similar to the preceding.

PLAT A (4).—Oregon blue grass (*Bromus unioloides*). Resown. Seems to be a winter annual. Self-sown seeds germinated in the fall, survived the winter, and headed out in June.

PLAT A (5).—Short-awned brome grass (*Bromus breviaristatus*). Poor stand.

PLAT A (6).—King's fescue (*Festuca kingii*). Fair growth, but did not head out.

PLAT A (8).—East half. Bearded wheat grass (*Agropyron caninum*). Did not head out, but grew fairly well.

Most of the west half in feather bunch grass (*Stipa viridula*), but growth poor.

PLAT A (9).—Giant rye grass (*Elymus condensatus*). Growth poor.

PLAT A (10).—Six lots of slender wheat grass (*Agropyron tenerum*). Made a growth of about 6 inches.

PLAT A (11).—Slender wheat grass (*Agropyron tenerum*). This plat, which was drilled, stood the drought better than the preceding, which was sown broadcast.

PLAT A (12).—Wild timothy (*Muhlenbergia racemosa*). Growth poor, but headed out in September. Killed by frost September 20.

PLAT A (13).—A mixture of curly mesquite (*Hilaria cenchroides*), blue grama (*Bouteloua oligostachya*), and King's fescue (*Festuca kingii*). Growth poor.

PLAT A (14).—Blue grama (*Bouteloua oligostachya*). Growth poor.

PLAT A (15).—Mixed grama grasses. Growth poor.

PLAT A (16, 17, 18).—Sown to *Bromus inermis*, *B. erectus*, *B. kalmii*, *B. tectorum*, *Agropyron pseudorepens*, *Dactylis glomerata*, *Muhlenbergia racemosa*, and *Poa nevadensis*, but all failed to germinate.

PLAT A (19, 20).—Turkestan alfalfa (*Medicago sativa turkestanica*). Grew well except during the midsummer drought.

PLAT A (22, 23, 24).—Western wheat grass (*Agropyron spicatum*). Growth fair, but did not form heads.

PLAT A (21, 25 to 29).—Smooth brome grass (*Bromus inermis*). Growth good except during summer drought.

PLAT B (1).—Planted to potatoes in preparation for next year.

PLAT B (2).—Planted in sugar corn.

PLAT B (3).—Planted to millets; west side to Japanese barnyard millet. Growth good, finally reaching a height of 4 to 5 feet. One of the best forage plants tested

this year. Another portion of plat planted to white Russian broom-corn millet (S. P. I., No. 1387). Growth poor. The remainder of the plat planted to red veronezh broom-corn millet (S. P. I., No. 2796). Growth very poor.

PLAT B (4).—Samarkand and French alfalfa. Drilled in rows 1 foot apart. Growth good in both cases.

PLAT B (5, 6, 7, 8).—Turkestan alfalfa (*Medicago sativa turkestanica*). Wintered well. Growth fair.

PLAT B (9).—Turkestan alfalfa (S. P. I., No. 991). Sown broadcast at the rate of 28 pounds per acre. Suffered from the midsummer drought. Killed by frost September 20.

PLAT B (10).—Australian saltbush ((*Atriplex semibaccata*). Drilled May 10 on the following plan: 11 rows on the west side, seed pressed in; 11 rows in the center, seed covered one-half inch; 11 rows on the east side, seed 1 inch deep. Seed did not sprout till June 20. Only a few plants came in at west side. In the center the stand was about 50 per cent, while on the east side the stand was about 25 per cent. Made a growth during the latter part of the season, but was all dead by the 1st of November.

PLAT B (11).—Bitter vetch (*Lathyrus sativus*). Made a fair growth and stood the drought well.

PLAT B (12).—Milo maize (*Andropogon sorghum*). Yellow variety cut September 10. Weighed, November 3, at the rate of 6,336 pounds per acre. White variety cut September 15. Weighed, November 3, at the rate of 12,693 pounds per acre.

The yellow milo maize formed heads, but the white did not.

PLAT B (13).—Egyptian corn (*Andropogon sorghum*). Stand poor and growth fair. Formed heads August 18. Cut September 11, when about 5 feet high. Weighed, November 3, at the rate of 3,120 pounds per acre.

PLAT B (14).—Wisconsin amber cane (*Andropogon sorghum*). Stand, about 50 per cent. Yielded at the rate of 2,960 pounds per acre.

PLAT B (16).—Hairy vetch (*Vicia villosa*). Failed to germinate.

PLAT B (17).—Rape (*Brassica napus*). West half, March rape, drilled May 10; not successful. East half, dwarf Victoria rape, drilled May 10, made a rank growth and yielded, September 1, green fodder at the rate of 26,880 pounds per acre. A single plant weighed 23 pounds.

PLAT B (18 to 24).—Sown to the following grasses, but all were killed by drought: Hard fescue (*Festuca scabrella*), red fescue (*Festuca rubra*), wild timothy (*Muhlenbergia racemosa*), Washington blue grass, rye grass (*Elymus canadensis glaucifolius*), smooth brome grass (*Bromus inermis*), and Western wheat grass (*Agropyron spicatum*).

PLAT B (25 to 30).—Smooth brome grass (*Bromus inermis*). A very poor stand.

PLAT C (1).—Planted to potatoes in preparation for next year.

PLAT C (2, 3).—Goose wheat. Severely injured by drought and Russian thistles.

PLAT C (4, 5).—Oats. Killed by drought.

PLAT C (6 to 11).—Russian speltz. Growth poor. Yielded at rate of 4 to 5 bushels per acre.

PLAT C (12).—Emmer (*Triticum dicoccum*). S. P. I., No. 2789, on part of plat, remainder sown to Russian buckwheat (*Fagopyrum fagopyrum*), S. P. I., No. 2801, but in both cases the young plants were killed by the drought.

PLAT C (13).—Planted to various varieties of imported wheats, oats, barley, and speltz, bitter vetch (S. P. I., No. 1175), horse beans (*Vicia faba*), and white soy beans, but all were killed by drought.

PLAT C (14).—Red Orenburg broom-corn millet, S. P. I., No. 2960 (*Panicum miliaceum*). Growth poor, but stood the drought better than any of the broom-corn millets except the black (Plat C, 19).

PLAT C (15).—Tamboy broom-corn millet, S. P. I., No. 2794. A red variety. Badly damaged by the hot winds.

PLAT C (16).—Red Russian broom-corn millet, S. P. I., No. 2797. Similar to preceding.

PLAT C (17).—A white variety of foxtail millet (*Chetochloa italica*). Made a fair growth. Cut September 6.

PLAT C (18).—A red variety of the preceding. Made a good growth.

PLAT C (19).—A black variety of Russian broom-corn millet, S. P. I., No. 2795. Made a fair growth and withstood the drought well.

PLAT C (20 to 30).—Sown to common millet to keep down the weeds.

An additional series (D) was broken up and planted this season, with the intention of carrying on experiments in green manuring, but owing to the dry weather they were not successful. Series E was broken up and sown broadcast to common millet to keep the ground clean.

SERIES F.—A portion of this had not been plowed for eight years and was very weedy in places. This portion was pulverized last May and sown broadcast with *Bromus inermis* and then dragged. The seed germinated about September 1, and the results will be noted the following season. The remainder of this plat is broken in preparation for the next year.

SERIES H.—Numbers 4 and 5 were treated with 40 loads of manure, which was harrowed in. These plats showed an increase of grass of about 30 per cent.

PLAT H (6).—Scarified and sown to *Bromus inermis*.

PLAT H (7).—Scarified and sown to Nevada blue grass (*Poa nevadensis*).

PLAT H (8).—Scarified and sown to King's fescue (*Festuca kingii*).

PLATS H (9, 10, 11, 12).—Scarified and left to be sown the following spring.

From the preceding it will be seen that the grasses mentioned in the report of 1899 as giving promise have in most cases confirmed the estimates placed upon their value. Among these may be mentioned smooth bunch grass (*Poa laevigata*), Nevada blue grass (*Poa nevadensis*), King's fescue (*Festuca kingii*), and Oregon brome grass (*Bromus unioloides*). On account of the extremely dry weather many of these did not form seed, but they nevertheless made a fair growth and thickened into more or less of a sod. A few other perennial grasses grew well in spite of the unfavorable conditions, such as bearded wheat grass (*Agropyron caninum*), slender wheat grass (*A. tenerum*), and western wheat grass (*A. spicatum*). Canadian blue grass (*Poa compressa*) made considerable growth early in the season and headed out by June 1, though it formed no seed. This grass, however, is not so valuable from an agricultural standpoint as some of the others. Smooth brome grass (*Bromus inermis*) made a favorable growth, though, like most of the other perennial grasses, it suffered from the summer drought, but it renewed its growth upon the return of more favorable conditions. This is undoubtedly one of the best grasses for the dry regions of the Northwest for both hay and pasture.

Turkestan alfalfa has grown fairly well, but so far it has not justified the claim of great superiority over the ordinary sort.

The Australian saltbush (*Atriplex semibaccata*) germinated poorly, but withstood the drought quite well. As it does not survive the winter it must be treated as an annual and sown each spring. Except on alkali soil, it probably is not to be recommended in this latitude, as there are other more promising annual plants for ordinary soil.

Among the annual grasses that furnish coarse forage there are sev-

eral that proved able to produce a crop in spite of the extreme conditions. Japanese barnyard millet is especially to be recommended. Common or foxtail millet also did well. The broom-corn millets made a fair growth, but the varieties tested thus far are inferior to the common millet.

The sorghums, including amber cane, Egyptian corn, and milo maize, in several cases produced a large amount of fodder, a white variety of milo maize yielding at the rate of 6 tons per acre (Plat B, 12).

Dwarf Victoria rape made a rank growth and yielded green fodder at the rate of 13 tons per acre.

Many varieties of grasses which were tried failed to get sufficient start before the summer drought and succumbed to the dry weather. These will be given further trial and doubtless some will prove of value.

It is evident that certain of the perennial grasses tried can be used for permanent pasture. But in case of prolonged periods of drought it is necessary to supplement the pastures by soiling crops. For this purpose Japanese barnyard millet, common millet, the sorghums, and rape can be used to advantage. Smooth brome grass and some of the other perennial grasses can usually be depended upon for hay. In addition to these hay can be obtained from the millets and cane.

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Approved.

JAMES WILSON,

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